length (only used to measure the *ratio* of the distance between the candles to the distance of the grating from either). The experiment showed the distance from centre to centre of consecutive bars of the grating to be 32 times the wave-length of yellow light. This being remembered to be $5 \cdot 89 \times 10^{-5}$ of a centimetre, it was concluded that the breadth of the space on which the 250 lines are engraved is $250 . 32 . 5 \cdot 892 . 10^{-5}$, or ·4714 of a centimetre! According to the instrument-maker it is really ·5 of a centimetre! Five minutes spent on the experiment instead of one, and sodium flames behind fine slits, instead of open candles blowing about in the air might easily have given the result within one-half per cent. instead of $4\frac{1}{2}$ per cent. Thus the cosmic traveller can easily recover his centimetre and metre measure. To recover his unit of time is less easy. One way is to go through Foucault's experimental determination of the velocity of light.

But he must be imagined as electrically-minded; and he will certainly, therefore, think of "v," the number of electrostatic units in the electro-magnetic unit of electricity; but he will, probably, see his way better to doing what he wants by making for himself a Siemens' mercury unit (which he can do easily, now that he has his centimetre), and finding (by the British Association method, or Lorenz's with Lord Rayleigh's modification, or both), the velocity which measures its resistance in absolute measure. This velocity, as is known from Lord Rayleigh and Mrs. Sidgwick, is 9413 kilometres per mean solar second, and thus he finds, in mean solar seconds, the period of the vibrator, or arbitrary-unit chronometer, which he used in his experiments.

Still, even though this method might be chosen as the readiest and most accurate, according to present knowledge, of the fundamental data for recovering the mean solar second, the method by "v" is too interesting and too instructive in respect to elimination of properties of matter from our ultimate metrical foundations to be unconsidered. One very simple way of experimentally determining "v" is derivable from an important suggestion of Clark and Bright's paper, referred to above. Take a Leyden jar, or other condenser of moderate capacity (for example, in electrostatic measure, about 1000 centimetres), which must be accurately measured. Arrange a mechanism to charge it to an accurately measured potential of moderate amount (for example, in electrostatic measure, about 10 c.g.s., which is about 3000 volts), and discharge it through a galvanometer coil at frequent regular intervals (for example, ten times per second). This will give an intermittent current of known average strength (in the example, 10^5 electrostatic c.g.s., or about 1/300,000 c.g.s. electromagnetic, or 1/30,000 of an ampere), which is to be measured in electromagnetic measure by an ordinary galvanometer. The number found by dividing the electrostatic reckoning of the current, by the experimentally found electromagnetic reckoning of the same, is "v," in centimetres per the arbitrary unit of time, which the experimenter in search of the mean solar second has used in his electrostatic and electromagnetic details. The unit of mass which he has chosen, also arbitrarily, disappears from the resulting ratio. It is to be hoped that before long "v" will be known within 1/10 per cent. At present it is only known that it does not *probably* differ 3 per cent. from $2 \cdot 9 \times 10^{10}$ centimetres per mean solar second. When it is known with satisfactory accuracy, an experimenter, provided with a centimetre measure, may, any where in the universe, rate his experimental chronometer to mean solar seconds by the mere electrostatic and electromagnetic operations described above, without any reference to the sun or other natural chronometer.

The remainder of the lecture was occupied with an explanation of the application of the absolute system in all branches of electric measurement, and the definition of the now well known practical units founded on it, called ohms, volts, farads, microfarads, amperes, coulombs, watts. The name mho, found by saying ohm to a phonograph and then turning the drum backwards, was suggested for a unit of conductivity, the reciprocal of resistance. The subdivision, millimho, will be exceedingly convenient for the designation of incandescent lamps.

The British Association unit has been found by Lord Rayleigh and Mrs. Sidgwick to be ·9868 of the true ohm (10^9 centimetres per second), which differs by only 1/50 per cent. from ·9870, the number derived from Joule's electrothermal measurements described in the British Association Committee's Report of 1867, with 772 Manchester foot-pounds taken as the dynamical equivalent of the thermal unit from the measurement described in his Royal Society paper of 1849, and confirmed by his fresh measurement of 20 years later, published in his last Royal Society paper on the subject.

It is satisfactory that, whether for interpreting old results, or for making resistance-coils anew, electricians may now safely use the British Association unit as ·9868, or the Siemens unit as ·9413, of the ohm defined as 10^9 centimetres per second.

U.S. NATIONAL ACADEMY OF SCIENCES[1]

THE annual meeting of this body was held in Washington during the last week, with an attendance of forty members. Scientific sessions were held on Tuesday, Wednesday, and Friday, in the large lecture-room of the National Museum, and business sessions on every day of the meeting.

Twenty-four foreign associates were elected as follows:—Astronomers: Prof. Otto von Struve, of the Imperial Observatory at Pulkowa, Russia; Prof. J. C. Adams, of Cambridge, Eng.; Prof. A. Auwers, Director of the Observatory at Berlin; and Prof. Theo. von Oppolzer, Director of the Observatory at Vienna. Mathematicians: Prof. Arthur Cayley, of the University of Cambridge, Eng.; Prof. J. J. Sylvester, of the Johns Hopkins University, Baltimore; and Prof. E. Bertrand, of Paris. Physicists: Prof. R. Clausius, of the University of Bonn; Baron H. von Helmholtz, Professor in the University of Berlin; Prof. Robert Kirchhoff, of the University of Berlin; Prof. G. G. Stokes, of the University of Cambridge, Eng.; and Sir William Thomson, Professor in the University of Glasgow. Chemists: Prof. J. B. Dumas, Secretary of the Academy of Sciences, Paris; and Professors M. Berthelot, Boussingault, Chevreul, and Würtz, all of Paris. Geologist: Freiherr von Richthofen, Professor in the University of Bonn, and President of the German Geographical Society. Botanists: Sir J. D. Hooker, Director of the Botanical Gardens at Kew, Eng.; Prof. A. de Candolle, of Geneva. Biologists: L. Pasteur, of Paris; Prof. T. H. Huxley, of London; Prof. R. von Virchow, of the University of Berlin; A. von Kölliker, Professor of Anatomy in the University of Würzburg. Prof. Struve, one of the newly elected foreign associates, who is on a visit to this country, was a regular attendant at the scientific sessions of the Academy, and read a paper.

In consequence of the death of Prof. W. B. Rogers, the President, it became necessary to elect his successor. On the first ballot, Prof. Wolcott Gibbs, of Cambridge, one of the founders of the Academy, was elected. He, however, firmly declined the honour, from a feeling, as he said, that he could not give the time necessary to the work. The Academy reluctantly acquiesced in the decision of Prof. Gibbs, and proceeded to a second ballot, when Prof. O. C. Marsh, of New Haven, the acting President, was elected by a handsome majority. The newly-elected President will hold office for six years.

The first act of the new President was to announce that he had received from Mrs. Mary A. Draper, widow of Prof. Henry Draper, the sum of six thousand dollars, accompanied by a deed of trust which fully specified the objects she had in view. He called upon Prof. Barker to explain the nature of the trust to the Academy. Prof. Barker first made some appropriate remarks, recalling Prof. Draper's interest in the Academy, and then read the deed, the substance of which is as follows:—The income of the trust is to be used "for the purpose of striking a gold medal which shall be called the 'Henry Draper Medal,' shall be of the value of two hundred dollars," and shall be awarded from time to time, but not oftener than once in two years, as a premium to any person in the United States or elsewhere who shall make an original investigation in astronomical physics, the results of which shall be deemed by the Academy of sufficient importance and benefit to science to merit such recognition. If at any time the income of the fund shall exceed the amount necessary for the striking of the medal, the surplus may be used in aid of investigations and work in astronomical physics to be made and carried on by a citizen of the United States.

The President appointed Messrs. G. F. Barker, W. Gibbs, S. Newcomb, A. W. Wright, and C. A. Young as a committee to have charge of the fund, to make rules to govern the award of the medal, and to suggest to the Academy for approval the names of those who may be considered worthy of the award.

The Treasurer announced that in accordance with the will of

[1] From *Science*, April 27.

the late Prof. James C. Watson the sum of about fourteen thousand dollars had been placed in his hands. When the estate is finally closed a further sum will be paid over to the Academy. The income of the Watson fund is to be used under the direction of three trustees—Messrs. J. E. Hilgard, S. Newcomb, and J. H. C. Coffin—for the purpose of aiding astronomical researches. In accordance with the recommendation of the trustees the Academy granted five hundred dollars from this fund towards defraying the expenses involved in observations of the total solar eclipse of May 6, 1883.

Later in the meeting Prof. Simon Newcomb of Washington was elected Vice-President, and Prof. Asaph Hall of Washington Home Secretary. Five new members were elected: Prof. A. Graham Bell of Washington, Dr. J. S. Billings, U.S.A., of the U.S. Army Medical Museum, Washington; G. K. Gilbert of the U.S. Geological Survey; H. B. Hill and C. L. Jackson, Professors of Chemistry in Harvard College. The whole number of members is now ninety-five.

On the afternoon of Thursday the Academy adjourned to take part by invitation in the ceremonies attending the unveiling of the statue of Prof. Henry in the grounds of the Smithsonian Institution. The time for these ceremonies was purposely fixed to coincide with that of the spring meeting of the Academy. Henry was preeminently a scientific man, and at the time of his death President of the Academy; and yet the members of the Academy were placed far down the line in the procession—after the Commissioners of the District of Columbia, and after officers of the army and navy. This fact must be regarded as evidence of a lack of appreciation of the relations existing between Henry and the Academy and of the true worth and dignity of science.

The exercises, which were in good taste, began with a short address by Chief Justice Waite. After this, at a signal, the covering was quickly drawn aside, instantly revealing the entire statue. Loud applause followed, those who were seated rose to their feet, and all hats were removed. The scene was highly impressive; and when the Philharmonic Society, accompanied by the full marine band, burst forth with Haydn's grand chorus, "The heavens are telling," the heart must have been a hardened one which did not experience a feeling of exaltation.

In the opinion of all, the statue is dignified and pleasing, and vividly calls to mind the honoured original. President Porter's oration, which was the principal event of the afternoon, was listened to with much interest. It dealt with the plain facts of the life of Henry, and was all that his best friends could have desired.

Among the pleasantest social features of the meeting was a reception given to the members of the Academy on Thursday evening by Prof. A. Graham Bell. There were present many well-known gentlemen, among them General Sherman, Chief Justice Waite, Senator Sherman, ex-Secretary Blaine, and the Japanese, Swedish, and Belgian ambassadors.

SCIENTIFIC SERIALS

Zeitschrift für wissenschaftliche Zoologie, Bd. xxxviii. Heft 1, February 20, 1883, contains:—On the vascular system and the imbibition of water in the Najadæ and Mytilidæ, by Dr. Hermann Griesbach (Pl. 1).—Researches among the Protozoa, by Dr. A. Gruber (Plates 2 to 4); describes and figures several new genera and species.—On the origin of the saliva (*Futter saft*) and the salivary glands in the bee, together with an appendix on their olfactory organ, by Dr. P. Schiemenz (Plates 5 to 7).—On the development of the red blood corpuscles, by Dr. W. Feuerstack (woodcuts).—Candid reply to my critics in the matter of the "Brain of Fishes," by G. Futsch.

Proceedings of the St. Petersburg Society of Natural History, Vol. xiii. Part 1, for 1882, contains: On the archæology of Russia, by Count Tivatkov (the Stone Period).—Notes of a journey on the Dnieper in 1844, by Dr. Kessler.—On *Capra caucasica*, Güld., by H. Dinnik.—Darwinism from the point of view of universal physical science, by A. Beketov.—A monograph of the Mysidæ to be found in Russia (Marine, Lacustrine, and Fluviatile), by Voldemaro Czerniavsky, fasc. 2. All the above articles are in Russian except the last, which is in Latin, and it is illustrated by four lithographic plates.

Journal of the Russian Chemical and Physical Society, vol. xv. fascicule 3.—On the hydrocarbon $C_{12}H_{20}$ obtained from the allyl dimethyl carbinol, by Prof. A. Zaytseff and W. Nicolsky.—On the hydrocarbon $C_{10}H_{18}$ obtained from the allyl dipropyl carbinol, by S. Reformatsky. It is a colourless liquid boiling at about 158° Celsius, insoluble in water, and easily soluble in alcohol and ether. It rapidly absorbs the oxygen of the air; density 0·787 at 0°, 0·774 at 16°, and 0·770 at 21°.—Chemical analysis of Kieff clays, by S. Bogdanoff. The white clay contains 96 per cent. of kaolins; the loess contains 83·5 per cent. of quartz, felspar, mica, and other silicates, 5·38 of kaolin, and 6·73 of carbonate of lime.—On the diisooctyl, by A. Alechin.—On the composition of the water which accompanies the naphtha and is discharged by mud-volcanoes of the Government of Tiflis, by A. Potylitzin (second paper).—An elementary demonstration of the pendulum-formula, and on a differential aërial calorimeter, by W. Preobrajensky.

THE *Archives des Sciences Physiques et Naturelles* for February, 1883, contains papers by C. E. Guillaume on electrolytic condensers; by Emile Yung, on the errors of the senses, a contribution to the study of illusions and hallucinations; by Ernest Favre, on the Geological Survey of Switzerland for 1882, concluded in the March number. To the latter C. de Candolle sends an interesting essay on the ripple marks formed on the surface of sands under water, and on other analogous phenomena.

THE *Journal de Physique théorique et appliquée* for March contains papers by Ph. Gilbert, on the experiments best suited for demonstrating the rotation of the earth; by G. Lippmann, on Helmholtz's theory of double electric layers as applied to electro capillary phenomena; by H. Pellat, on the same subject; by A. Rosenstiehl, on the definition of complementary colours; by Ch. Cros and Aug. Vergeraud, on a direct positive photographic paper.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, March 15.—"On the Changes which take place in the Deviations of the Standard Compass in the Iron Armour-plated, Iron, and Composite-built Ships of the Royal Navy on a considerable change of Magnetic Latitude." By Staff-Commander E. W. Creak, R.N., of the Admiralty Compass Department. Communicated by Capt. Sir F. J. Evans, R.N., K.C.B., F.R.S., Hydrographer of the Admiralty.

The period comprised between the years 1855–68 was one of active research into the magnetic character of the armour-plated and other ships of the Royal Navy and iron ships of the Mercantile Navy.

Among other contributions to this subject a paper by F. J. Evans, Staff-Commander R.N., F.R.S., and Archibald Smith, F.R.S., was read before the Royal Society in March 1865, relating to the armour-plated ships of the Royal Navy, and containing the first published results of the system of observation and analysis of the deviation of the compass established four years previously.

From lack of observations in widely different magnetic latitudes the authors of that paper were unable to define the proportions of the semicircular deviations arising from vertical induction in soft iron and that arising from permanent or sub-permanent magnetism in hard iron.

During the last fifteen years vessels of all classes—except turret ships—have visited places of high southern magnetic inclination or dip, and the analysis of the deviations of their standard compasses has been made, showing the constants of hard and soft iron producing semicircular deviation.

The constants for soft iron provide a means of predicting probable changes of deviation on change of magnetic latitude for certain vessels of the following classes, and others of similar construction.

1. Iron armour-plated ships.
2. Iron cased with wood.
3. Iron troopships.
4. Iron and steel cased with wood.
5. Composite-built vessels.
6. Wooden ships with iron beams and vertical bulkheads.

These vessels were all in a state of magnetic stability previous to the observations which have been discussed, and their compasses have had the semicircular deviation reduced to small values, or corrected, in England by permanent bar magnets.

This correction may be considered as the introduction of a permanent magnetic force acting independently, and in opposition to the magnetic forces of the ship proceeding from hard iron,